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USSR Report

MACHINE TOOLS AND METALWORKING EQUIPMENT

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ROBOTICS

MISMANAGEMENT IN MACHINEBUILDING MINISTRIES CRITICIZED

Moscow IZVESTIYA in Russian 5 Nov 85 p 2

[Article by correspondent V. Sukhachevskiy: "A Particularly Important Branch"]

[Text] It is difficult to overestimate the role of machine building in the intensification of the economy and acceleration of scientific and technological progress. Advanced machines fundamentally change the nature of labor, immeasurably increase its productivity and quality and make it possible to apply the most economical technologies, which in turn reduces the material intensity of production and increases the return on fixed production capital.

The importance of machine building as the basis for technological progress of the whole economy is especially growing given the reduced growth of material-technical and labor resources. At the CPSU Central Committee conference on questions of accelerating scientific and technological progress it was noted that if we were to further provide for developing the economy on the former, largely extensive basis, it would be necessary each five-year plan to increase the output of fuel and raw materials by 10-15 percent and capital investments by 30-40 percent, and bring in to the economy an additional 8-10 million people. But, we do not have such capabilities.

There is another path, more promising and intelligent -- the accelerated development and improvement of machine building. This question was examined at a CPSU Central Committee Politburo session. Fundamental measures were outlined to improve matters in the machine building complex. In particular, capital investments for its development in 1986-1990 will exceed the amount of funds assimilated in the current five-year plan by 1.8 times.

The particular importance of the machine building complex to the whole economy determined the nature and thrust of the work of the preparatory commission on machine building, which met for two days in Moscow. Questions related to the course of 1985 plan fulfillment and the draft plan for 1986 were examined, as were matters related to fulfillment of the 1984 budget and the machine building draft budget for the first year of the 12th Five-Year Plan.

T. N. Menteshashvili, secretary of the USSR Supreme Soviet Presidium, deputies of the USSR Supreme Soviet who are members of the joint preparatory

commission, and representatives of interested USSR ministries, state committees and departments took part in the session.

Reports by USSR Gosplan, the USSR Ministry of Finance, the State Committee for Science and Technology and USSR Gossnab were heard, as well as information from leaders of Mintyazhmash [Ministry of Heavy Machinery], Minenergomash [Ministry of Power Machine Building], Minelektrotekhprom [Ministry of the Electrical Equipment Industry], Minkhimmash [Ministry of Chemical and Petroleum Machine Building], Minpribor [Ministry of Instrument Making. Automation Equipment and Control Systems], Minavtoprom [Ministry of the Automotive Industry], Minlegpishchemash [Ministry of Machine Building for Light and Food Industry and Household Appliances], Minzhivmash [Ministry of Machine Building for Animal Husbandry and Fodder Production], Minstroydormash [Ministry of Construction, Road and Municipal Machine Building], Minstankoprom [Ministry of the Machine Tool and Tool Building Industry] and Minselkhozmash [Ministry of Tractor and Agricultural Machine Building].

The reports and statements by ministry leaders and the speeches by members of the preparatory commission and deputies of the USSR Supreme Soviet emphasized that machine building has the predominant and key role in implementing the scientific and technological revolution. Now one of the main tasks is to make maximum use of existing production capacity and as a first priority carry out reconstruction of the branch. It is necessary in the quickest period of time to set up mass production of new generation equipment, capable of increasing labor productivity many times over and opening the way to automation of all stages of the production process.

During 1986 the base machine building branches will receive priority development: machine tool building; instrument making; electronics and computer equipment, which will make it possible on the basis of the achievements of modern science and technology to accomplish the technological reequipping of all branches of the economy, including, as a top priority, the machine building complex itself. Major decisions were made on this account and it is necessary to control strictly their fulfillment.

The discussion of reports and statements was principled and critical in nature. This is understandable. Despite the advances outlined, serious problems are being felt in the machine building complex. Session participants remarked that the ministries have not yet taken all necessary steps to bring into action all organizational-economic and social reserves, directed at improving the final results of the work. Almost every fifth machine building enterprise is not fulfilling its plans for increased labor productivity and profits, and is permitting an increase in the cost price of production.

The session participants scrupulously delved into the reasons for lags, analyzed the situation which had been created and made proposals to eliminate shortcomings. The discussion was sharp, frank and impartial. But it undoubtedly will help future work. So that the reader can imagine the content and spirit of this discussion (its transcript ran approximately 200 pages), we offer here a condensed account of several questions and answers which were heard during the discussion.

Question: "For some reason it has become the rule to allocate lower capital investments in the first year than in subsequent years. In our view a reduced tempo is also envisioned for the first year of the 12th Five-Year Plan. Why is this?"

S. Sitaryan, deputy chairman, USSR Gosplan: "Gosplan believes that in distributing capital investments an arithmetic method is not entirely suitable..."

"Don't avoid a direct answer. One thing is clear to us: It is impermissible to start a five-year plan with excessive swings. The first year must set the tone for all the work."

"Gosplan will look into this comment."

Question: "How much is to be allocated to the construction of design and experimental bases of scientific research institutes and design buros?"

A. Kamenev, deputy chairman, USSR GKNT [State Committee for Science and Technology]: "I gave these figures for each ministry. I can repeat them."

"Then we do not understand your conclusion that everything is, you say, fine. How can this be? The deputies have information that you are not fulfilling basic points of the well-known CPSU Central Committee and USSR Council of Ministers decree on scientific and technological progress. Why do you give such an optimistic conclusion?"

"I had in mind those changes which will be entered in the plan."

"Nevertheless, we did not receive an answer to the question that we asked you."

"I can say only that we had a difficult situation with the development of the design and experimental base."

Chairman: "I recall the document which we adopted last year: 'The commission notes the systematic non-fulfillment of plan targets for development of science and technology; there are delays in the accomplishment of scientific and technological programs...' It turns out that we must again repeat this comment. Who is at fault for the fact that the situation is not improving?"

The GKNT chairman was forced to acknowledge that the committee had not done and was not doing everything which depended on it.

Question: When will the agricultural requirement be satisfied for equipment for the introduction of intensive technologies?

Yu. Boyev, deputy chairman, USSR Gossnab: "Minselkhozmash and Minzhivmash are planning a number of measures for the next five-year plan."

A. Yezhevskiy, minister of Minselkhozmash: "In 1986 we will begin the modernization of agricultural equipment outlined for the 12th Five-Year Plan.

It is envisioned that the volume of production of agricultural machinery next year will increase 9.6 percent, but the growth in output of equipment for intensive technologies is to exceed this amount."

K. Belyak, minister of Minzhivmash: "This year's plan for output of new equipment will be completely fulfilled. There is a lag only in one loader, which is manufactured in Ivano-Frankovsk Oblast."

Question: "This year the number of unauthorized absences from work increased in Minzhivmash enterprises. What is the reason for this?"

K. Belyak: "This can be explained, unfortunately, only as inadequate organizational work on the part of the ministry."

Session participants subjected the work of all 11 machine building ministries to detailed analysis. It was noted that in a number of branches there still remain large unproductive expenditures, losses from unprofitable products and from defective goods, which are especially high in Minavtoprom and Minselkhozmash. One in three machine building enterprises is not fulfilling the targets for reducing the expenditure norms for rolled ferrous metals.

Targets for putting fixed capital into operation are not being fulfilled and the standard time periods for assimilating capacities are being violated. Supplies of uninstalled equipment have increased over the beginning of the year. One fourth of the supplies are of Minselkhozmash.

Minstankoprom, Minpribor, Minkhimmash and Minlegpishchemash are not fulfilling their targets for bringing into economic exchange reserves of material valuables which are in excess of norms.

The session participants paid a great deal of attention to questions of capital construction and more rapid assimilation of newly introduced capacities. The report by V. Polyakov, minister of Minavtoprom, on the transition of the branch during the 12th Five-Year Plan to production of new, most advanced models of both trucks and light vehicles, was received with particular satisfaction. In particular, the Moscow Automotive Factory imeni Likhachev, which is associated with the manufacture of diesel tractor-trailer rigs, is to undergo fundamental reconstruction. Similar reconstruction is also being carried out at the Gorkiy Automotive Factory, the main supplier of farm vehicles. The Minsk and Kremenchug heavy vehicle factories are transitioning to new equipment, as are all enterprises manufacturing passenger automobiles.

But the session participants did not only examine technical questions. They devoted much attention to the selection, indoctrination and distribution of cadres, everyday social problems and the development of consumer goods production in enterprises of the machine building complex. USSR Supreme Soviet deputies Yu. Malashenko, A. Korotenkov, R. Kulbachnaya, N. Priyezzhev, M. Iksanov, A. Zarubin, V. Faustov, G. Oganyan, M. Kalashnikov, V. Nikulin and other comrades showed with facts and specific real-life examples the interdependence between conditions and labor results.

The rates of development of the machine building complex contained in the draft plan for 1986 are overall sufficiently intense, but, at the same time, as the discussion showed, they are realistic. The commission especially stressed the importance and necessity of successfully fulfilling that which was scheduled, in order to lay a stable base for fulfilling the program of the whole 12th Five-Year Plan.

The commission worked out recommendations, which will be considered during the final formation of the plan for 1986.

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ITEMIZED, ANNUALIZED MACHINE TOOL, EQUIPMENT OUTPUT TOTALS

Moscow VESTNIK STATISTIKI in Russian No 10, Oct 85 p 70

[Text]

4. Production of Individual Types of Machine Building Products

	1975	1980	1981	1982	1983	1984
Metal cutting machine tools						
thousand items.....	231	216	205	195	190	188
million rubles.....	1359	1944	2047 1960	2073	2200	2390
including (1,000):						
automatic/semiautomatic lathes	5.7	5.3	5.1	4.8	4.8	4.5
grinders	14.0	11.6	11.4	10.9	10.3	10.3
milling machines	22.8	20.9	18.9	18.3	18.6	18.1
Woodworking machine tools (1,000)	50.8	43.7	43.2	42.5	42.4	42.4
Industrial electric furnaces (1,000)	10.9	13.0	15.3	15.3	25.8	51.2
Gantry cranes (each)	101	115	121	106	95	96
Electric block and tackle (1,000)	101	104	103	100	101	98
Battery-operated trucks (each)	9859	8547	8566	8218	8677	10,200
Concrete mixers (1,000)	30.8	29.6	29.1	28.7	28.1	21.3

Technological equipment and spare parts for food, meat, dairy and fishing industries (million rubles)*	451	565	567/605	631	688	748
including: milk separators (1,000)	14.4	14.2	14.0	12.9	12.1	11.0

* Production data expressed in cost for 1981 shown in two values: in the numerator -- in wholesale prices of enterprises on 1 Jan 75, which also applies to data for previous years; in the denominator -- in wholesale prices of enterprises on 1 Jan 82, in which products are calculated starting in 1982.

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PERCEIVED NEED FOR FOREIGN PRODUCTION MACHINERY QUESTIONED

Moscow PRAVDA in Russian 5 Dec 85 p 2

[Article by S. Pastukhov under "Time and People" rubric: "We Can Do It"; first paragraph is PRAVDA introduction]

[Text] Publicistic notes on the collective of the association Elektrostaltyazhmash, where they produce superb equipment.

I will begin by presenting three facts that are certainly related, although at first glance they are from different "operas."

First, one of my friends decided to write a novel, acquired some chalk paper and bought a gold West German fountain pen at "Shkolnik" in Moscow. He bought it for...85 rubles.

Second, a gray-haired neighbor on my drive changed over to the "most fashionable" Italian jeans. What we used to call ordinary "sack cloth," trousers for cowboys and swineherds, they now cost...100 rubles.

Third, for a great deal of money--golden chervontsy--we buy various machines and equipment from foreign firms, even though we produce many of them ourselves. In Kemerovo Oblast, for example, not very long ago I had the occasion to see incredibly expensive heavy-duty Japanese dump trucks used in the open-pit extraction of coal. And alongside them were similar Belorussian trucks costing just a fraction as much.

How can that be? At that same "Shkolnik," they sell gold pens produced domestically.... "How can they compete with 'Pelican' or 'Parker'--they leak quickly," explained my friend. "Sack cloth? But look how they are made! And the 'label'--the firm's tag--is really something!" exclaimed my neighbor with delight. And the representative of Kemerovougol tried to convince me that on the Japanese dump trucks it is easy for even an average driver , as he says, to transport a million tons a year....

All three cases are correct in their own way. Indeed, abroad they know how to make things that are attractive and high in quality. But so much emotion about "foreign" companies, such deference to particular "firms." I am not going to involve myself in feelings of this nature. We have long been

familiar with them as well as their negation by several of our own merits, by the way. In his film, "Volga-Volga," even Byvalov reiterates: "We have no talented people...." People dance and sing like real performers and he says there is no one.

Not at all! We do have such people. They are everywhere. And it did not befit us to humble ourselves before anyone at all. I thought about this more than once as I became familiar with the people and their work at the association Elektrostaltyazhmash near Moscow.

"Let me remind you," related Yevgeniy Sergeyevich Smelov, its general manager, that "Elektrostaltyazhmash is the only enterprise in the country that plans, produces and delivers to metallurgical plants tube rolling and tube arc welding machine units, metallurgical and enrichment equipment and related spare parts, as well as rollers for rolling mills. About two-thirds of all of the steel tubing in the country is produced on units with the grade 'EZTM'. Without them, neither a tractor, nor a bicycle, nor central heating, nor a water supply line nor many other things are possible. Today's world is based on tubing...."

As a rule, the association's products are well-made and of good design. It is exported to many different countries, including the FRG....

And, my friends, a tube rolling mill is not a splendid trifle but a very complex steel machine unit weighing 5,000, 10,000 or even 20,000 tons!. It requires several trains just to move one. And despite the tremendous tonnage, all of the steel parts and particles are extremely precise and extremely well coordinated.

In short, it is marvelous unit! But it was not so long ago--in the memory of many of those with whom I spoke at the association--that we not only did not have such pipe rolling mills but it seemed that we did not dare dream of them. We did not, for example, have mills on which it would have been possible to produce large-diameter steel pipe for the main gas and oil pipelines. We bought them from the capitalists....

"Until the angry rooster pecked," said, in remembering that time, Lev Aleksandrovich Dyachenko, a first-class turner and drill operator and a permanent party group organizer in his section of the association's first assembly shop, where he has now been working for 42 years.

Indeed, it pecked angrily.... The West German Government, then led by Adenauer, who was known for his malice toward us, forbade its capitalists to deliver large-diameter steel pipe to the Soviets. Under U.S. pressure, the industrial firms of Sweden and Japan also refused to make such deliveries. They cut us off completely.

"We had no place to turn," continued Lev Aleksandrovich, "and we took it upon ourselves to build a mill for rolling such pipe. We did it as in the military...."

"As in the military," in the words of Dyachenko, who became a machine operator as a youth in 1943, means working not from whistle to whistle but until total victory is achieved. I am not going to repeat the entire epic about the construction of the mill. Everyone knows how it turned out: in record time--just 1 year--the unit was built and, having been set up at the Chelyabinsk Pipe Rolling Plant, it began to "roll out" its own, Soviet, pipe for us. They then went into the main gas line Bukhara-Ural and into the Druzhba oil pipeline. At that time, many were awarded orders and medals and L.A. Dyachenko became a Hero of Socialist Labor.

These events, of course, are not recent but happened a long time ago and it may be that it is not worth mentioning them. But they are sometimes repeated in another form, each time demonstrating how we are able to respond. In addition, just as you do not take words out of a song, you do not remove pages from our history. After all, these pages, beginning with October 1917, are dear to us, for they are written with blood and sweat. These pages, whatever facts they deal with, say that we Soviet people are equal to any task, that we have the ability to do anything that we put our minds to without going elsewhere for the energy and talent.

So it is that in the association's experimental shop we faced a kind of a mountain of a machine, unique in the words of its owners. Taking a closer look, however, I said:

"Did I not see it already in your showroom on the movie screen?"

"No," answered Prof Igor Illarionovich Kazakevich, doctor of sciences and one of the developers of the machine, "you have never before seen such a unit, even in the movies. This is a superpowerful steel robot created for the accelerated production of the most varied ingots with minimal tolerances, that is, ingots where practically nothing remains for machine-tool machining. A tremendous saving!"

Similar machine units, or more accurately units with a similar function, are also built in the developed capitalist countries. But there the design is far more complex than ours, the dimensions are much much larger and each of the units costs many millions in gold. I do not hesitate to repeat myself in saying that our individual is capable of creating great wonders. This truth has also been known for a long time, but each time that you see it manifested in a new form, in new specific facts and events, there is no end to your surprise and pride. And sometimes you are perplexed as well.

Let us take that same Belorussian dump truck that is being used in Kuzbass alongside foreign trucks. For 5 years now, the brigade of Viktor Grigoryevich Dubinets, member of the Mezhdurechensk Gorkom bureau, has been hauling a million tons of rock with a 40-ton "Belorussian", as much as other people using a "Japanese" with three times the power. And Dubinets has followers working in the "million-ton regime."

Nevertheless, something else must be said here. The Belorussian motor vehicle plant in the city of Zhodino delivers its dump trucks to 20 countries of the world, and there they have carved out a solid place for themselves. But in

their native land, in Kuzbass, many "BelAzy" frequently stand idle: maybe a bolt comes loose or perhaps some rubber band breaks and there are no spare parts, cry as you will. It happens that coal miners, having received a totally new dump truck from Belorussia, must still put a lot of effort into it, tightening up bolt or screws or doing some other finishing work, before getting behind the wheel. The quality of plant assembly work "per se" is low, or, as the drivers put it, it is "if only...." So it is that the plant is losing its good reputation.

How much better our results could be if it were not for all these "bolts" and "rubber bands"! If the Belorussian truck builders did their work the way that the Kuzbass driver Dubinets does his! How much faster we would move along that path chosen in 1917 if everyone approached his duties the way that the turner and drill operator Dyachencko near Moscow does....

"One could work even better," he suddenly smiled unhappily, "if, as they say, they did not have these faults."

What kind of "faults?"

"I have, after all, been working alone on this machine tool for a long time now," related Dyachenko, "I alone combine, among other things, the jobs of janitor, greaser, production engineer and technical inspector. Sweat covers me like soap. Put a helper on my shift and together we will, I am sure, quadruple output. But they will not do it, saying it is too expensive and they do not know where to find anyone. I trained more than 30 drill operators but not many of them are working here now. Some became engineers, some went 'over the fence' to our neighbors where they say they have more benefits. I will be retiring soon and I do not know who will take my place...."

Yes, this is a very serious problem for the association. There are 1,300 machine operators working here, first-class specialists with the experience and imagination to shoe a flea.... But we have fewer and fewer young people. Fewer and fewer of them want to work on a lathe. After all, there are easier and more lucrative jobs. The management of the association is asking the management of the sector about measures that could raise the prestige of a number of blue-collar occupations.

The association's turners told me that for several years now they have been successfully using some kind of new lubricating-cooling fluid for the machining of metals. In this way, their cutting tools last three to five times longer and the quality of the machining itself is higher. It turned out that this fluid was developed by Doctor of Sciences I.I. Kazakevich, whom we already know, his Lvov colleague A.I. Soshko, and some of their other comrades. And they literally made it out of the wastes of petroleum products. Compared to an industrial emulsion, the application of the innovation in the operations drilling, sharpening and milling of carbon and alloyed steels yields an average annual savings of hundreds of rubles per unit of metal-cutting equipment through the increase in labor productivity and tool savings and the reduced use of electric power. If it were applied to all of the machine tools in the country, it would amount to no less than 1 billon rubles....

If only.... The new lubricating and cooling fluid is still being applied only in part and only in some enterprises. It is being produced in a very limited quantity at the Lvov Oil Refining Plant only. Prof Kazakevich said that the inventors and the management of the Ministry of Heavy and Transport Machine Building first applied to the USSR Gosplan and the Ministry of the Petroleum Refining and Petrochemical Industry but were refused. Supposedly there are "no capacities" where the new material could be produced.

It is necessary but we are reluctant to stoop and pick up a fortune that is literally under our feet! Or maybe a role was played by the fact that the new material lacked that firm's "label" that so captivated my neighbor on the drive?

These days we read the drafts of the new version of the CPSU Program, Party Rules and Basic Directions and see how communists and all of the country's working people are facing increasing large and complex tasks. We see that it will be necessary to give up some of our customary "old baggage" and above all our "former" philosophy that says that we do not have any talent of our own and that some things are beyond our capabilities.

We do have the talent! Look at any collective and you will find this talent. And we are capable of anything....

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1823/071

PROBLEMS WITH EQUIPMENT REPAIR, SPARE PARTS ADDRESSED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 4 Dec 85 p 2

[Article by P. Golovkov, chief, External Cooperative Section, Avtoremgormash Factory: "Prolonged Correspondence"]

[Text] The Belgorod Factory, Avtoremgormash, subordinate to the Soyuzruda VPO [All-Union Industrial Association] of USSR Minchermet [Ministry of Ferrous Metallurgy] has existed for 30 years. It has specialized in major repair of quarrying dump trucks. Whenever there is a repair factory it must have spare parts support. This support is of two types: so-called original; i.e., manufactured by the automotive factory itself, and purchased -- obtained by the automotive factory from parts suppliers through cooperatives. The former came to us from the Yaroslavl Motor Factory and the Belorussian Automobile Factory more or less punctually. But, to "dislodge" purchased parts it was necessary to send obscure "expeditors" constantly to cities and throughout the country -- we had no other way to obtain spare parts for repairs.

The situation changed following the message by the USSR Council of Ministers about providing quarrying dump trucks with spare parts. The idle giants were too costly to the economy. The two above named factories were to undertake delivery of the full line of spare assemblies, sub-assemblies and parts. Passions subsided; the suppliers and consumers found a common language. It turned out that the repairmen pretty well understood the needs of the truck builders. According to agreements which were concluded they began to manufacture some kinds of spare parts, non-standard equipment, etc. Practice showed that this partnership based on mutual interest is highly effective and creates conditions for fulfilling and overfulfilling plans and commitments.

But nothing is forever under the sun. Yesterday's quarrying giants became in time merely small fellows and were replaced by 75 and 180 ton dump trucks. There are more than 300 such herculian monsters now operating in the enterprises of Soyuzruda alone. But even they are wearing out and need repair. We have repaired heavy trucks since 1980. Repairs to new type machines and assemblies has already reached one-fourth of the total number.

Seemingly, lift capacity has no relationship to the principles of material support. However, only seemingly. In January 1983 USSR Gosplan approved and put into effect maximum standards for the expenditure of spare parts for the

new types of dump trucks. Then, on 13 December of the same year came the signing of the protocol by representatives of Minavtoprom [Ministry of Automotive Industry], Mintyazhmash [Ministry of Heavy and Transport Machine Building] and Minenergomash [Ministry of Power Machine Building]. This protocol, signed by former first deputy chairman of USSR Gosplan, L. Voronin, confirmed the existing system of providing spare parts and it also promised to implement a number of other service measures. But the protocol remains on paper. According to the opinion of USSR Gosplan leaders, someone else, but not themselves, was to force compliance with this decision.

A lack of control led to the fact that in the future not a single regulating document repeated the fundamental thesis from the existing intelligent system for delivering spare parts to repairmen (either original or purchased). The distressing situation of years long past was repeated literally at once: The manufacturers of diesel engines for dump trucks -- the Sverdlovsk Association, Turbomotornyy Zavod imeni K. Ye. Voroshilov and the Balakovo Machine Building Factory imeni F. E. Dzerzhinskiy -- considered that established precedent did not concern them.

How does this look in practice? The parts nomenclature for diesel engine 6DM-21A, for example, approved by USSR Gosplan for suppliers, consists of 452 names, and the Balakovo factory delivers only 148, or a little more than one-third. And what about the rest? This is not known. A similar situation exists regarding the Sverdlovsk workers.

Perhaps we should work harder and ourselves lay the road to the Ural and Volga parts suppliers? But we are not a supplying organization and, consequently, our approach there is regulated by clear governmental procedure. In addition to this, the diesel engine manufacturers belong to different ministries (Mintyazhmash and Minenergomash), which introduces, to put it mildly, considerable difficulties in their own relations. This is expressed most of all in that there is a lack of standardization of products and parts sets. This multiplies geometrically the problems facing the clients.

Correspondence has been going on at various levels for more than two years already. We write to the chief administration, USSR Minchermet [Ministry of Ferrous Metallurgy], Minenergomash and Mintyazhmash, but this correspondence looks more like a one-way game. No definite answer has been obtained. The need for a progressive system for providing repair enterprises with all parts does not meet with understanding from the manufacturers of final products. It looks as though we will step over the threshold of the 12th Five-Year Plan with disordered economic ties, behind which already today superpowerful quarrying dump trucks, which froze awaiting repair, are being lined up.

I read with hope in the draft Main Directions in the "Machine Building Complex," section the words: "Develop in every way repair of complex and particularly precise equipment by firms and maintenance by manufacturers..." This directly concerns us also and, therefore, I vote for it with both hands.

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INDUSTRY PLANNING AND ECONOMICS

WORK OF MACHINE TECHNOLOGY ASSESSMENT CENTER VIEWED

Moscow, MASHINOSTROITEL in Russian No 10, Oct 85 pp 4-5

[Article by L. I. Zhukova, deputy chairman, Lvov Oblast Administration, NTOmashprom[Scientific and Technical Society of the Machinery Industry], and N. A. Ivnitskiy, chairman of the Administrative Section: "Implementing the Comprehensive 'Labor' Program"]

[Text] Significant work in implementing the special purpose comprehensive program for reducing manual labor by the application of automatic lines and industrial and robot systems is being carried out in Lvov Oblast. The Lvov Oblast Administration of NTOmashprom [Scientific and Technical Society of the Machinery Industry] and the Lvov TsNTI [Central Scientific and Technical Institute] are initiators of the broad dissemination of the experience of enterprises in the mechanization and automation of production. They are revealing, studying, systematizing and generalizing advanced experience in the creation and introduction of robots and robot systems; creating and constantly supplementing the "data bank" of patent, technical specification, methodological, reference and other documentation on robotics; organizing training and methodological work and holding consultations for enterprise and organization specialists; participating in compiling methodological recommendations and conclusions for developing robots and introducing them into industry; coordinating with party, soviet and planning organs and the regional section on robotics of the Western Scientific Center of the UkSSR Academy of Sciences (Lvov); and organizing scientific and technological propaganda measures.

In order to provide enterprises and organizations with the latest information on scientific and technological achievements in robotics, the oblast NTO Administration, along with the regional section of the Western Scientific Center of UkSSR Academy of Sciences for Robotics and the Lvov TsNTI prepared and sent to consumers of information six special topical selections, describing advanced Soviet and foreign experience; standardized topical documentation on robotization of production processes; the bibliographic catalogs, "Industrial Robots and Robotics Systems;" methodological instructions, "Development and Creation of Flexible Automated Machining;" and the methodological recommendations, "Determining the Economic Effectiveness of Flexible Automated Production." These publications, which are in great demand

among machine builders, have become an aid for specialists in the introduction of flexible production systems.

The scientific and technological conference, "Problems of Creating Flexible Automated Production;" the scientific and technological seminar, "Experience in the Development and Introduction of Automatic Manipulators and Industrial Robots;" the school of advanced experience, "Use of Industrial Robots for Welding;" and comprehensive days of the specialist and robotics information days have been carried out effectively and with great practical results by the administration. An exhibit, "Industrial Robots," was prepared and is being demonstrated in the Lvov TsNTI.

A permanent consultation point has been created within the "Automation and Comprehensive Mechanization of Machine Building" faculty of the Lvov Polytechnical Institute imeni Leninskiy Komsomol to assist enterprise specialists in mechanization and automation of production and creating robots and manipulators. Faculty scientists have made agreements and are assisting enterprises in the creation of robotics complexes and flexible automated systems.

The number of robots in industry is constantly increasing. The oblast NTO Administration has selected and transmitted to the Lvov TsNTI for publication and dissemination as information leaflets technical data on such innovations as the MAK-1-50 automatic conveyor manipulator, a sack loading manipulator and the SMTK-50 manipulator, which were introduced into the Konveyer Production Association imeni 60th Anniversary of the Great October Socialist Revolution; a UKBM-200 control system based on the SM-1800 microcomputer, developed and introduced into the conveyor construction PKI [planning and design institute]; an adjustable robotics complex for bending and coiling two-dimensional parts at the Lvov Polytechnical Institute, etc.

In generalizing the experience of Lvov Oblast associations and enterprises in reducing manual labor, the presidium of the oblast NTOmashprom Administration noted in its 1984 resolution the enterprises with favorable experience in introducing robots and manipulators. Among them were the Avtopogruzchik Production Association, which introduced a robotics system in stamping operations; the motor factory, which set up robots at painting and stamping sections; the autobus factory, where robots are operating on metallic coating and wheel mounting lines; and EKTIavtoprom [expansion unknown; possibly experimental technical design and testing for the automotive industry] which developed a manipulator for painting products.

The conveyor construction PKI analyzed the introduction of robots and flexible automated systems in oblast enterprises and is presently compiling a program for their introduction for the 12th Five-Year Plan. Primary NTO organizations are taking an active part in this work.

The successes of leading Lvov Oblast machine building enterprises in developing and introducing robotics will become a substantial contribution to implementing the program for reducing manual labor. The first steps have already convincingly confirmed the effectiveness of this way of increasing labor productivity and of accelerating the transition to economic

intensification. For the scientific and technological community this is all the more important in that this year will be the republic review of the achievements of engineering thinking within the framework of the comprehensive "Labor" Special Purpose Program. Each machine builder understands its importance and is making every effort to fulfill it successfully and to greet worthily the 27th CPSU Congress.

9069
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SHORTAGE OF MACHINE TOOLS IN TRAINING CENTERS NOTED

Leningrad LENINGRADSKAYA PRAVDA in Russian 5 Dec 85 p 2

[Article by O. Nosareva: "About Robots Plain and Simple: How They Prepare Specialists at Some Vocational and Technical Training Centers"]

[Text] Is it possible, for example, to train a highly skilled operator of machine tools with numerical control "without sugar," without work ing on these same machines? Can one assign expensive manipulator robots to an adjuster who has seen this equipment only from a distance?

Strange questions, you will say. It is, of course, necessary to train specialists in work processes determining scientific-technical progress by closing linking theory with practice. There is simply no other way.

At SPTU-42 [Rural Vocational and Technical Training Center] of the association Kirovskiy Plant, for 3 years they have been teaching operators and adjusters of NC machine tools and adjusters of manipulator robots but there are no training workshops where they can acquire practical skills in these specialties. During the preceding 2 years, the young future workers went through general fitters and assemblers training, but this year the time has come under the program for them to "familiarize themselves" directly with extremely complex equipment. Where can they do this?

"Right at the enterprise," thinks V.I. Sergeyev, the association's deputy general director of for work with personnel.

Frankly, it is hard to believe. Yes, our interlocutor immediately remarks that at first it is difficult even for an experienced worker to cope with equipment that is loaded with electronics. Precisely for this reason, the best SPTU's organize training on special "training" robots and machine tools. And there should be at least one or two of them at each training center. Do they really see no need for such equipment at SPTY-42?

Everything falls into place when we check the record of the joint conference of the representatives of Glavlenprofobr, SPTU-42 and the association Kirovskiy Plant. It clearly indicates the urgent necessity of organizing new workshops and equipping them with up-to-date equipment. There is also a point about the need to make use of the SPTU's existing NC machine tools.

"What kind of a machine tool is it," asks V.I. Sergeyev with interest, "somehow I do not remember."

The "forgetfulness" of the deputy general director is perhaps no accident, even though he signed the minutes of the conference. At the moment, the responsible comrade hardly wants to remember that the indicated machine tool was literally "thrown out" to the SPTU. For until now not a single specialist has been able to get the mechanism back in working order.

Naturally, the question of the improvement of the training of young workers did not arise for the association this school year. And not even in the spring, when the conference whose record we mentioned took place. The draft of the documentation was put together...more than 10 years ago. Even then it was clear that the training center, once among the best in the country in its level of equipment and quality of training, had begun to decline, and the main reason for that situation was its backward material base. Not much has changed since then. Not only the future robot technicians have to learn "without sugar" but also the machine operators. Those milling machines and lathes that stand in the workshops here have long since been missing in the association. The students receive practical experience on equipment that should have been written off a long time ago.

This situation of the base enterprise is fraught with the most unpleasant consequences for the school. One of them is obvious: young citizens of Leningrad are not very eager to come here. Of the 8 schools sponsored by Kirovskiy Plant, 8 people came to the training center each of the last 2 years and 15 came this year. And there is nothing surprising about that. Today students take their selection of an occupation and an educational institution seriously. Before applying for admission, they prefer to examine carefully the conditions of study that are offered. And here SPTU-42 quite simply cannot meet the "competition" with dozens of wonderfully equipped training centers of other enterprises. Should that not concern the managers of the association Kirovskiy Plant? The question is perhaps rhetorical.

It cannot be said that the association is doing nothing for "its own" school. Here they speak with pride of the recently-built 15-story dormitory for the future young workers. Without a doubt, it is a splendid building. But who knows, if the association had concentrated its efforts on improving the material base of the school and on making it more attractive in the eyes of the Leningrad students, then perhaps it would not have had to spend millions building the dormitory?

That is the way things are not only at Kirovskiy Plant and SPTU-42. It must be stated that the material base clearly does not meet the requirements of the day at many training centers, including those whose base enterprises have begun to carry out their own programs for the intensification of production.

What is the matter? It would seem that it was not so long ago that we could say that in Leningrad and in the oblast the establishment of the material base of vocational and technical training was basically completed. Why is this problem arising again?

If we considers the matter, it is all logical. The process of the intensification of production is setting completely new tasks for the vocational and technical school as well. These problems cannot be resolved at the previous level of equipment, which even yesterday could be considered inadequate.

Who is lagging behind today? Let us name just a few addresses such as SPTU-21 of the association imeni Karl Marx, SPTU-85 of the associations Lenpodemtransmash imeni S.M Kirov and Pnevmatika, and SPTU-102 of the scientific production association Krasnaya Zarya....

Obviously, the process of the improvement of the material base is a rather expensive and lengthy process. Let us consider also that the enterprises themselves often lack up-to-date equipment. So one can hardly speak of the immediate resolution of the problem. But the clearly protracted "pause" in the process of the improvement of the material base of quite a number of SPTU's cannot fail to be a cause of concern. For we are, in the final analysis, talking about the personnel base of the intensification program.

9746
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BRIEFS

ITALIANS TO BUILD FACTORY--Sumy--Construction of a new factory for the manufacture of high strength weighted and kelly drilling pipes for the development of oil and gas fields has begun in Sumy. It is planned that the enterprise will have three plants: steel casting, heat forging and machining. Metal scrap will serve as the raw material and the factory will operate completely and entirely using no-waste technology. Management of all technological processes, accounting and control of the arrival and expenditure of raw materials, fuel and energy resources, and delivery to the warehouse of finished products will be accomplished by computer. In accordance with the contract concluded between the all-union foreign trade association, Stankoimport, and the Italian firm, Danieli, the "turnkey" construction of the factory will be completed by the Danieli firm and turned over to the purchaser in the first quarter of 1988. [By SOTSIALISTICHESKAYA INDUSTRIYA correspondent V. Zenkovskiy] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 4 Dec 85 p 2] 9069

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COMPONENT STANDARDIZATION FOR FLEXIBLE PRODUCTION SYSTEMS

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 8, Aug 85 pp 29-31

[Article by E.A. Panfilov, candidate of technical sciences: "Unification and Standardization--An Important Factor in Creating Flexible Production Systems"]

[Text] An important role in the improvement of machine building is played in our country by the course we have taken to create flexible production systems. This course has been established by the modern pace of technical progress, the great list of machines necessary to the national economy, frequent changes of production objects and the necessity to reduce labor, time and materials costs as much as possible in order to start the production of new, more advanced machines.

The introduction of flexible technology allowing the quick and efficient adjustment of industry for production of new items has now become one of the main directions in improving industry's technological base.

Many organizations and establishments of various ministries and departments have taken part in work to create flexible production systems. However, we still lack the necessary methodological and organizational prerequisites for a clear understanding of concrete tasks and principles for creating flexible production systems. Within even a single ministry, we can observe differing interpretations of the requirements for flexible system technical equipment and much variety in the very basic concepts of this technology. It is therefore, a matter of great significance was the recent confirmation of state standard GOST 26228-84 defining the basic terminology for flexible production systems such as flexible production system, flexible production module, flexible automated line, flexible automated section, shop and factory and flexible automated production, etc.

According to GOST 26228-84, a flexible production system is "a set or individual item of technological equipment together with the systems supporting its automated operation that can be automatically adjusted to the production of any type of part within established limits or parameters". The basic element of a flexible production system is the flexible production module, a unit of technological equipment with an automated program control

device and process automation devices which independently functions to perform numerous operative cycles on its own and is capable of being built into a higher-level flexible production system. The flexible production module can be formed from magazines, accessories, loading and unloading devices as well as from tool-changing and fitting, waste-removal, automated-control and readjustment devices, etc.

Aside from its "flexibility" (ability to be quickly adjusted), a flexible production system provides a higher degree of automation to the production process, high output of a greater list of manufactured items and a lower number of produced lots, a reduced production cycle (blank-to-finished item) and finally, a considerable reduction of labor and time for technological preparation for the production of new items.

It is a complicated task to quickly equip our industry with highly-efficient and economical flexible adjustable means of production. As extensive experience has shown, the most effective way to implement this is to organize a program of specialization and cooperation between branches of industry to produce flexible production systems through standardizing and unifying their components.

Unification has the goal of "standardizing parts through by establishing a reasonable number of variations" (GOST 23945.0-80). In particular, unification is oriented at the use in new items of components, parts, units or aggregates that have the same or similar functional purposes. The method of unification is to create unified components that can be used in various items. Its efficiency lies in the reduction of time needed to create new high-quality equipment more cheaply.

The methods used to create flexible production systems are of particular significance. Unification of flexible production system elements makes it possible to introduce a more economical modular principle of designing a system structure and employ the aggregate principle of building them from unified flexible production modules; unification provides technical (configuration), energy and program compatibility (mating) of the components of a flexible production system.

Unification of the elements of a flexible production system makes it possible to create flexible modules that differ in their characteristics and use from the same (unified) elements such as components, parts, machines, transport systems, program control systems, technological fittings, etc. Unification simplifies the operation and maintenance of these modules and a flexible production system also makes it possible to create a stock of interchangeable parts, units, aggregates and entire modules which reduce down-time for overhaul. On the basis of unification, it is possible to create a large number of systems such as aggregate machine systems that present a set of unified units and aggregates for assembling metal-working machines and unified systems of program control. The unification of flexible production control systems has encouraged the quick development of domestic microprocessor technology and the creation of economical computers with great functional capabilities.

Our nation has already gained some experience in creating flexible production systems from flexible modules.

Thus, as the Orgstankinprom Science and Production Association and the Gorky Milling Machine Factory (Ministry of Machine-Building Industries), there has been developed and manufactured the model ASK-11 flexible production system for small-lot production of body parts of up to 300 kilograms in quantities of 10-50 units.

The Ivanovo Machine-Building Association (Ministry of Machine-Building Industries) has mastered the production of the model ASK-20 flexible production system for producing body parts of up to 500 kilograms. This system consists of four unified modules, each of which is a multipurpose machine (the IR 500 MF4 or IR 800 MF4) equipped with automatic tool changers and all-purpose detachable attachments and accessories. The ASK-20 consists of automatic blank and accessory magazines, a transport system with manipulator and other devices. The ASK-20 is controlled by an SM-2 computer with internal devices that store and process data and can exchange it with the NC devices of the machines, transport system controls, magazine, etc. The introduction of the ASK-20 has replaced 23 workers.

The Experimental Scientific Research Institute of Metal-Cutting Machinery and other organizations have created a gamma of flexible production systems similar to the ASV-2 that are also composed of unified flexible modules and can be used for small-lot manufacture of parts such as bodies of revolution. The Orgstankinprom Association has developed unified flexible production modules consisting of lathes or mills, delivery-transfer and rotary tables for transport of containers and blanks to the machine loaders and part manipulator. These modules have been assembled to form a flexible production system for small-lot machining of more than 400 types of bodies of revolution, flanges, lids, levers, various bars, etc.

Soviet-made flexible production systems have successfully used adjustable technological fittings such as all-purpose detachable machine attachments arranged from all-purpose components and parts.

One of the main principles for the creation of flexible production systems by foreign firms is also their assembly from unified flexible modules and executive systems. As a rule, each of these firms has created its own unified base of elements including independently functioning aggregates and multipurpose blocks for varied uses and systems. It must be said that the firms' traditions, technical and economical possibilities and to a considerable degree their competition determine the various technical solutions they employ to create single-type flexible production systems and unify their components.

West German firms such as Werner und Kolb, Emag, Schermann, and others have manufactured aggregate machines composed of unified elements and program control systems. These firms have made broad use of unified flexible modules, autonomous systems that can perform a limited number of technological operations such as cutting, drilling, boring, lathing and grinding, etc.

The Italian firms of Mandelli, Olivetti use in their flexible production systems multipurpose machines equipped with unified components such as changeable aggregate heads, multispindle heads, rotary blocks, instrument magazines, etc. The Japanese firm Niigata produces a unified series of flexible production systems designed to machine body parts in a large range of sizes and designs. The same principle has been used by Toyoda and Hitachi Seiki to create unified series of flexible production systems.

Highly-efficient flexible production systems are being created by the industry of the CEMA nations. For example, the Fritz Hekkert Plant in the German Democratic Republic has manufactured a flexible production system consisting of unified production modules and designed to machine prismatic body parts (the Prisma-2 system) and gears (the FZ-200 system). Since both of these systems employ unified modules, they can be put together to form variants according to the properties and lot-size of the items to be produced. Flexible production systems like these are also being produced by Czechoslovakia and Poland.

As we have now seen, the creation of flexible production systems from unified modules was the result of research and trial and error. Flexible production systems from unified modules manufactured at the Gorky Milling Machine Factory and designed to machine body parts have been introduced to many Soviet factories. The Ivanovo Machine-Building Association is series-producing the unified Module-500 system for manufacturing body parts while the Moscow Red Proletariat Machine-Building Factory imeni M.T. Yefremov has begun series production of unified flexible production systems that can manufacture bodies of revolution, etc. This has therefore made it possible for the machine-building factories can assemble flexible production systems themselves.

However, although all of the described flexible production modules can with some justification be considered unified, they were unified by the plants producing them. Intra-factory unification is of course effective and makes it possible to reduce labor and material costs while simplifying the introduction, operation and maintenance of flexible production systems made from these modules but it cannot form the basis for the organization of specialized production of the modules themselves or of their components within even a single branch of industry. To efficiently exploit its advantages, unification should be carried out on a level no lower than that of the branch (especially the machine-building branch) and in the case of more massive elements of flexible production systems, the unification should be organized between branches of industry and be based on branch and state standards. This work must be carried out as soon as possible. Any delay in inter-branch unification will lead to such an unjustified assortment of similar designs that it will become a serious hindrance to the organization of specialized production not only of the flexible modules themselves and their structural elements but also of programming systems, automatic transport systems, etc.

It will very soon become necessary to develop a complex of normative technical documents (GOST, branch standards and directions) defining the requirements on the elements of flexible production systems with regard to their technological compatibility, incorporation, productivity indicator agreement, reliability and possibilities for forming them into aggregates. It is also necessary to

work out united methodological principles for unifying system elements and for their modular and aggregate construction.

Practice has shown that many existing standards make no allowance for the new requirements on production means posed by the creation of flexible production systems. It would be advisable to analyze state and branch standards on technological equipment, fittings and instruments and control and measurement devices, etc. and make the necessary changes. For example, existing standards on machine attachments do not make any provision for automation while these standards are applied to the attachments used in flexible production systems. In applying existing standards to the stability of cutting instruments and the precision of their manufacture, the norms for their strength and vibration-resistance are insufficient for these instruments when they are used in a flexible production system.

Many of the standards that comprise the united systems of design and technological documentation should be properly reviewed.

It would be very useful to develop inter-branch catalogues of unified elements and indicate their basic parameters and operating characteristics and for the chief branch organizations designing flexible production systems to create an information fund or data bank on the use of unified elements of these systems would all be very useful.

Unification of the computer technology used in flexible production systems is a very urgent task. Little has been done about this up to now and that has made it difficult not only to unify other elements of flexible systems but has also considerably complicated the design, operation and maintenance of these systems. As B. Timofeyev* of the Ukrainian Academy of Sciences has correctly pointed out, many mini- and microcomputers do not have unified systems of commands and printed circuit boards used for the same purposes and produced by many different departments are structurally incompatible. For organizing the specialized production of control equipment for flexible production systems, it is necessary to unify on time specialized (local) systems of program control that can provide centralized programming of specific types of unified flexible production modules. We need a single unified series of such systems built from a common base of elements and designs with a single system of software and unified programming languages.

Flexible production systems formed from unified elements provide the transition to personnel-free industry. However, we must remember that the creation of flexible production systems, unification of system elements and the introduction and operation of these systems require a highly-qualified specialist cadre of designers, technicians and production organizers that are capable of providing the best design and reliable performance of all system components. With this in mind, we might find useful the experience of the municipal professional training schools and technical schools in Leningrad where workers and specialists with middle-school educations were given

*Timofeyev, B., "Na ostriye vnedreniya" [On the cutting edge of introduction], PRAVDA, 25 January 1985.

training in flexible production system adjustment and other specialists

received higher training on current problems in the creation of these systems. What is also necessary is a broad exchange of advanced experience in the creation of flexible production systems and the unification of their elements and organization of reliable and useful information on the achievements of separate branches and plants.

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'TALKA-500', OTHER FLEXIBLE PRODUCTION SYSTEMS VIEWED

Moscow TEKHNIKA I NAUKA in Russian No 9, Sep 85 pp 1-5

[Article by V. Vasilyev, member, State Committee on Science and Technology and candidate of technical sciences: "Toward the Plant of the Future"]

[Text] One of the most important ways of further intensifying and improving the effectiveness of production is through full-scale automation. This does not refer to individual operations or manufacturing methods, but to the entire production complex, beginning with the development of documentation for a product and concluding with its being shipped to the customer. In the future, GAP's--flexible machine systems [FMS]--will solve this problem.

Specialists believe these systems will make it possible to

increase labor productivity in individual industrial sectors by 4-8 percent;

reduce the period needed to initiate production and produce new products by 10-fold;

increase the machine shift coefficient by 1.5-2-fold, i.e. reach its uttermost limits.

State Committee for Science and Technology member and candidate of technical sciences V. Vasilyev tells what flexible machine systems will represent and tells which systems have already made their appearance here in our country.

Contradictions in Modern Production

There has very likely never been such an increase in the complexity of the machines, machine tools and instruments produced by industry as has been witnessed in the last quarter century. The following are the requirements of the NTR [scientific and technical revolution]: constant updating, and improvements in quality and reliability. However, this natural process has engendered not only a number of problems, but quite a few contradictions, the resolution of which is no simple task.

Indeed, the introduction of automated production equipment, inevitable considering present-day conditions, on the one hand greatly increases labor productivity and reduces prime production costs, and on the other hand hinders production flexibility. It is a fact, for example, that a great portion of automated production lines have been set up for specific products. The service life of these lines ends, as a rule, when the run of their products ends, since this costly equipment is devoid of versatility or the capability of being retooled for the manufacture of new products.

Single-unit and small-lot production is characterized by its use of universal machine tools. These machine tools have great mobility and productivity built into them. But for a number of reasons, these capabilities are far from being fully utilized. The median loading factor for the machine tools used in machine-building amounts to 0.3-0.4. And the result is that the introduction of newer, more expensive and more productive equipment involves an increase in the cost of an enterprise's fixed capital, and the return on the investment increases slowly, with low profitability.

And another facet of this problem is that were one to analyze the work of any one machine-building enterprise, it would be impossible to notice whether the increase in labor productivity on the whole lags in any degree behind the increase in productivity of newly introduced machine tools, machinery or equipment. This is caused in the main by differentiation in production operations, and by the fact that the need to machine parts on several types of machine tools (lathes, milling machines, drills, grinders etc.) sharply curtails machine time and increases the time needed to carry out auxiliary operations. For example, base members are usually machined on 10, 12 or more machine tools. This is the number of times that the blank has to be set up and fastened onto the machine tools and then, after it is machined, removed and taken over to the next machine tool. As a result, the parts spend more time waiting to be machined than they do actually being machined.

If we compare the time spent in forming operations--cutting, stamping, welding etc.--with the total time spent from the beginning of the designing process to the time the finished product is shipped from the plant, we get an impressive picture. Take the total time for these operations as 100 percent. Then the time that the product blanks spend on the machine tools comes to a mere five percent of the time the blanks spend in the shops, and the net time spent in cutting operations, depending on the tool used, comes to 15-30 percent of the time the blanks spend on the machine tools. In short, only one or two percent of the time used to manufacture the parts is spent machining them.

One could also mention still other contradictions which have arisen in the field of machine building, and which stem from the scientific and technical revolution. However, the scientific and technical revolution has also shown us ways to overcome and eradicate these inconsistencies. Among these ways are the development of new computer and microprocessing equipment, numerically-controlled machine tools, machine tools which are directly controlled by computers, the creation and saturation of production facilities with machining centers, the introduction of SAPR [computer aided design], automated working positions (ARM's), robots etc. These are precisely the means by which we will actually be able to set up GPS's [flexible production systems] and FMS's.

PRODUCTION FLEXIBILITY

Everything associated with the automation of production can be evaluated on four levels of flexibility.

The lowest level is that of inflexible automation, which is when equipment is designed to manufacture only one specific product.

The intermediate levels are occupied by equipment which is being rebuilt and readjusted.

The highest level is for flexible-use equipment. This is the equipment which interests us, as it is the most promising. Its special features lie in the fact that, with regard to its capabilities to manufacture a lot of products of various types in any sequence, and for it to be converted to the manufacture of a completely new product, production need not be shut down in order to re-tool or readjust it. And if, say, its cutting tools, or the robot's grabbers or control program need to be replaced, then all this can be done, as they say "on the run", without shutting the equipment down.

Flexible production systems first appeared here in 1964, but saw no active implementation until the 1980's. Even the first, not entirely perfected flexible manufacturing systems displayed the ability to resolve many inconsistencies, and show as well that they could create conditions for achieving a high degree of labor productivity, and that they could make it possible for an enterprise to change over to the manufacture of new products quickly and with minimum expenditures. In a word, the flexible manufacturing system, and following in its footsteps the FMS, have become the primary method for developing the machine-building industry.

V. N. Vasilyev

WHAT ARE FLEXIBLE MANUFACTURING SYSTEMS AND FMS's ?

A flexible manufacturing system is a combination of machine tools of the type used in machining centers (machining centers are used for boring, drilling, milling machining operations and lathe machining centers are used in all types of lathe work), which centers provide maximum centralization of the machining operations. Machining centers are equipped with machine tools designed to carry out a number of operations, and which are controlled by a computer operating in dialogue mode. In this instance, the machine tools not only receive a command which tells them what to do, but also report back to the computer, telling it, in effect, what they have done, and data regarding their condition, the working order of their tools and the progress of the production process.

The constituent elements of a flexible manufacturing system are the non-interacting modules which are capable of machining parts of varying shapes and sizes.

The modules, in turn, have an interlocking structure, and are assembled from finished units. It is precisely the modular construction which has predetermined the flexibility of these flexible manufacturing systems, which reduces the time spent in setting them up and which reduces their cost as well.

The practice of integrating these flexible manufacturing systems with SAPR's [computer aided design systems], with ASU TP's [plant technical management automation systems], flexible billet manufacturing systems and flexible assembly manufacturing systems creates FMS's as well. Continuing with this line of thinking, it follows that there will be other automated systems connected to an FMS, down to the "labor force" automated control system and the "clerical work" automated control system. And this is how a flexible automated plant--the plant of the future--comes into being. These will be plants where all types of work and processes will be successfully automated, beginning with the study of an assignment to work up a new product, and finishing with the product packaged and sent to the customer. At the same time, with the help of computers and automatic control systems, such problems as the maintenance and repair of equipment, the calculation of technical and economic indicators and the economic effectiveness of production, finance and accounting and labor force support will be solved as well.

The flexibility of the plant of the future will predetermine the constant modernization of our enterprises, as opposed to the periodic modernization which we now have. This means that there will be a constant influx of the achievements of the scientific and technical revolution, as these achievements appear on the scene. Flexible manufacturing systems will work hand in hand with this concept, thanks to their modular structure, which makes it possible to exchange individual machine tool units or entire machine tools with new ones.

The setting up of a flexible machine system is a task so complicated that it cannot be undertaken locally by single enterprises, on an individual basis. The entire economic complex must operate in a more coordinated fashion, must observe discipline in their deliveries, and must improve the quality of the tools and the outfitting with accessories, robots and computers for FMS's to be introduced.

Alongside their immense economic effect FMS's will also engender important social results. The nature of machine tool operators' jobs will be changed radically. Electronic equipment operators and repairmen will play a decisive role, as will other specialists who have higher and middle-level specialized educations.

Not only will FMS's accelerate the process of shifting many occupations to a more intellectual level, but they will also free workers from monotonous physical labor, having provided them with the opportunity to either raise their skill levels or develop new, more interesting and creative occupations.

LOOK WHAT WE HAVE TODAY!

The Japanese firm Fudzitsu Fanuk's robot plant was much talked of in its time, and even though it came close to FMS's, this was, in the opinion of specialists only a test of strength. So far, no one in the world has yet succeeded in setting up a flexible automated production system, in the full sense of the word. However, an intense amount of work is being carried out in this direction, both here and abroad.

The first harbingers of this trend were seen, for example, in Ivanov at the Machine Tool-Building Production Association imeni 50-letiya USSR machine-tool complexes. These automated machine tools were designed to machine up to 100 stationary base member parts in small-series runs. All of the processes, from receiving the blanks to shipping the finished parts, is done automatically, under computer control. Each such complex can take the place of the equipment now used by an entire shop. Series production of these flexible manufacturing systems, which have been designated "Talka-500", is in the works. ("Talka" is the name of the river upon the banks of which stands the Ivanov Heavy Machine Tool Plant).

The Talka flexible manufacturing system can be broken down into several subdivisions: the production department, the department which sets the plant up for production and for the finished products, and the control department.

The first of these includes several machining centers. For example, the Module-500 Machining Center is a multipurpose machine tool equipped with a horizontal spindle and a 500 X 500 mm table. It is equipped with automatic toolchangers and a set of accessory tables where the previously mounted blanks can be machined with a high degree of precision. This unit has an eight-position memory in its accessory tables. The Modul-800 Machining Center is similar to this unit.

For a production subdivision, a transport system is a requisite component. With its help, the Talka flexible manufacturing system delivers the billets which have been set up on the accessory machine tool tables, from the loading stations to the machining center ramps, and sends machined parts from these ramps to the delivery points. This is precisely the system by which sets of cutting tools, which are automatically loaded into the machine tools' magazines, are delivered.

The subdivision for preparation of production includes automated warehousing of the billets which are affixed onto the accessory machine-tool tables, as well as the accessory tables with assembled locating attachments. Hence, to the storehouse, and from the storehouse to the loading station, they are delivered along live-roller tables. This subsection is made up of a great quantity of other auxiliary equipment as well.

The Talka flexible manufacturing system has bi-level control. The upper level is an SM-2 computer, which processes, stores and puts out information for the lower-level units, and puts out software necessary to the operation of the system.

The lower level is occupied by the devices which track the NC machine tools, those which control the transport system, the automated warehouse etc.

Along with the Talka, our country has devised ASV [automated computing system] type integrated-automated sections--the fruit of a scientific and design concept of collectives of the ENIMS [Experimental Scientific-Research Institute for Metal-Cutting Machine Tools] NPO [Scientific Production Association], of the All-Union Scientific-Research Tool Institute], the Orgstankinprom [State Planning, Production and Experimental Institute for the Organization of the Machine-Tool Industry] NPO, the Ryazan Machine Tool-Building Production Association and a great number of other organizations.

Lathework, thread-cutting, drilling, core drilling, the reaming of holes and the milling of flat spots and grooves are all carried out in these sections. In addition, out-of-round shapes can be machined when needed.

Standard variants of the section provide for the availability of eight, 12 or 16 machine tools with NC, including semi-automatic lathes and drilling-milling machines.

Right now there are 16 associations and plants in the machine tool-building sector which are retooling for the manufacture of machining centers and flexible production modules. This year will see the manufacture of 14,500 machine tools with NC, including 1,550 machining centers which will augment the flexible manufacturing systems. Minstankoprom [Ministry of the Machine Tool and Tool Building Industry] plans for 1985 are calling for the setting up of 15 flexible manufacturing systems. Efforts are ongoing to include measuring and production lasers as part of the flexible manufacturing systems, as well as new automatic diagnostic procedures and adaptations.

The devising and production of all this equipment will increase without interruption, thus creating the material base for flexible manufacturing systems and flexible machine systems.

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BRIEF

NEW FLEXIBLE PRODUCTION SYSTEM--At the Stankokonstruktsiya Factory in Moscow, the assembly and set-up of the ASV-201 automated flexible production system for machining lathe body parts will be completed by the end of 1985. Specialists from the Experimental Scientific-Research Institute of Metal-Cutting Machinery (ENIMS) and those from the plant itself have been involved in this project. The system will make possible automated machining of a series of parts for individual lathe components and mechanisms. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 29, Jul 85 p 15] 12261

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POOR PLANNING OF DEVELOPMENT, IMPLEMENTATION OF ROBOTS NOTED

Riga SOVETSKAYA LATVIYA in Russian 28 Dec 84 p 2

[Article by E. Krukovsky, director of the Central Mechanization and Automation Design Bureau, Honored Industry Worker of the Latvian SSR: "The Ways to Technical Progress: Robots Are Knocking at the Shop Doors"]

[Text] Two years ago, the Central Mechanization and Automation Design Bureau was appointed the chief organization for robotics, machine-building and the fitting out of robotic complexes in the Baltic region. Within the bureau, a robotics technological design division was created along with a special center for teaching robots and the adjustment of robotic complexes. The division has already produced many interesting developments. These are typical robotic complexes that can machine tools from one or from several sides simultaneously by drilling, boring, counter-sinking or threading.

Nine basic variants of typical robotic complexes have been worked out. These differ in the amount and arrangement of the power heads. They can also be used to build 69 types of special complexes to machine parts of various configuration. The introduction of only two (threading and drilling) complexes to the Kazan Teplokontrol Production Association made it possible to replace 12 workers (lathe operators, tool-setters, transport workers) and 10 metal-cutting machines. It has been calculated that the yearly savings from the introduction of these complexes amounts to more than 200,000 rubles.

However, experience has shown that many difficulties in introducing industrial robots robots are caused by the lack of proven means of fitting robotic complexes. Every time some technological process is roboticized it becomes necessary to develop, manufacture and set up a memory and blank feeding and setting devices, etc. Therefore, the specialists of our bureau, having become acquainted with the work of the robotization services of the Riga Railway Wagon Factory, the Riga Electrical Machinery Factory, the Kommutator Production Association and many factories in Lithuania and Estonia, have estimated that the amount of time it takes to introduce robots to industry when it has typical fittings could be reduced 2-3 times down to a few months or even weeks. At the present time, this takes more than a year.

In order to hasten this process, several interesting new types of fittings for industrial robots have been proposed by colleagues of the Physics Institute of

the Latvian Academy of Sciences. Our bureau has created universal vibrating feed bins. They are used to bulk load blanks, automatically orient and singly feed parts into the machining zone.

However, on the republic scale, this is not what counts. It seems that it might be helpful to specialize the most powerful plants in the republic, regardless of which ministry they are subordinate to, to produce various fittings for robotic complexes. In our opinion, this work could be organized by a republic robotics commission which as part of the Gosplan [State Plan] of the Latvian SSR.

The introduction of robotic complexes is only part of the overall problem of a comprehensive approach to the automation and robotization of industry. Often, let us say, robots are put into the same technological chain with antediluvial equipment. Therefore, they are constantly underworked, operated for one shift instead of two or three and break down because of low blank quality. In such cases, there is no need to talk about any savings from their use. For some directors, the "itch" for robotics turns into disenchantment and a striving to use any reasoning, true or false, to "disown" robots. Robotization should be introduced where the industry is ready for it and where it is really needed: in harmful sections, in shops with a severe shortage of labor and at plants where there is no other means of increasing output.

Such a comprehensive approach can now be provided by so-called FMS (flexible manufacturing systems). Specialists know that the word "flexible" in the given case underlines the fact that these systems can be quickly set for the production of new articles with little participation from operating personnel and this is something that our national economy very much needs. It is FMS that allows us to create in earnest an operator-free technology where man is replaced by equipment at all levels of production from the feeding of materials and blanks to be machined to the storage and inventory of finished parts.

Today our collective is introducing FMS to the Tekhnopribor Factory in Mogilev. Other than our bureau and experimental factory, five other organizations have become involved in this project. This is only the first experiment but we can already talk about the difficulties we have encountered. These same difficulties have been experienced by many others, including those who have worked on the development of machine-tooling FMS as well as those who have decided to introduce these systems at their own plants. No small amount of trouble is caused by the lack of necessary technological equipment, its unsuitability for work with robots and computers, the shortcomings of computers and their peripheral equipment.

The main and most promising means of overcoming these difficulties is to standardize the robots themselves as well as of their technological equipment. Practically every ministry and department is now trying to create industrial robots "for itself". At a certain stage this may have been justifiable as the search for new designs was very extensive. Now, however, we must conduct this search deeply rather than broadly, that is, we must select the best examples of robotics and carry further the work to improve and standardize them and

provide the necessary resources for their manufacture. We must also properly think through the problem of arranging FMS systems.

Just as any new technology, robotics needs its own specially trained cadres. For the time being, young specialists with only the most general ideas about robotics come to our bureau, the associations and factories. Until recently, these specialists were trained in "machine-building technology". It is quite clear that they lack enough knowledge and experience to begin work immediately to develop and introduce robotic complexes or FMS. Many of our institutions of higher learning have now begun to train engineers in roboticized production technology. With particular impatience we are awaiting the promised generation of graduates from the Riga Polytechnical Institute even though this will in itself not solve the entire problem. I think that robotics should be given more attention in the republic's system of raising the qualifications of engineers and scientific workers.

There are still many other obstacles to the introduction of robotics. To successfully overcome them, it is above all necessary to create in industry compelling economic and social conditions for better management on the part of directors and also for worker collectives to search steadfastly for ways to increase their productivity and to reduce heavy and nonproductive manual labor. It is then that the use of robots will become neither a duty nor a fashion but a real need.

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